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I, TERESA KOLODZIEJCZYK, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PS 1529 for a patent by ROGER LAURENCE COOKE as filed on 04 April 2002.

WITNESS my hand this
Ninth day of April 2003

TERESA KOLODZIEJCZYK
TEAM LEADER EXAMINATION
SUPPORT AND SALES

Regulation 3.2

Roger Laurence Cooke

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

"Evaporative Coolers"

The invention is described in the following statement:

EVAPORATIVE COOLERS

The present invention relates to an evaporative cooler and more particularly to an evaporative cooler for use in a ducted cooling system.

Conventionally, an evaporative cooler for use in a ducted cooling system comprises a large box-like housing installed on the roof of a building and includes an outlet for cooled air which extends through the roof for connection to ducting installed within the roof space for distribution of the cooled air to selected parts of the interior of the building. The housing contains evaporative pads through which external air is drawn by a fan mounted within the housing, for discharge through the outlet and ducting connected thereto. Evaporative pads of relatively large area are needed to obtain the required volume of cooled air and as a result, the overall housing of the cooler is relatively large. Accordingly, the installation of an evaporative cooler particularly on the pitched roof of a domestic dwelling where, typically, the housing has a significant projection over the roof line, can be very unsightly. Moreover, a fan of high capacity is required to generate the requisite air flow and this can result in substantial noise generation externally of the housing particularly when the cooler is operating close to its maximum capacity. This noise generation can be quite troublesome in an urban situation and can result in nuisance to near neighbours.

According to the present invention there is provided an evaporative cooler having a housing adapted to be installed within the roof space of a pitched roof, said housing having an air inlet associated with one or more evaporative pads defining an air-permeable cooling means, means for supplying water to the or each pad, and a fan for drawing external air into the housing via the air-permeable cooling means and for discharging the air thereby cooled via an outlet, wherein the housing is so configured that the air-permeable cooling means is closely adjacent the external surface of the pitched roof.

Particularly advantageously, the inlet to the housing is so configured that the or each pad forming the air-permeable cooling means lies substantially in or closely adjacent to the plane of the roof. It is to be understood that the air-permeable cooling means need not

necessarily be parallel to the plane of the roof or flush with the roof; it may be inclined through a small angle to the plane of the roof and/or project slightly from the plane of the roof.

In a preferred embodiment of the invention, the housing is generally of wedge-shape of a width to fit between rafters of the pitched roof and with an inclined upper side which extends in or parallel to the plane of the roof in the longitudinal direction of the rafters, the upper side including or forming the air inlet. The air-permeable cooling means formed by the pad(s) is mounted to the upper side of the housing and is thereby substantially planar in form.

Advantageously water is applied to the or each evaporative pad by spraying or drip feeding water onto the external surface of the pad. The base of the housing defines or contains a reservoir for supply of water to the pads and also to receive water draining from the pads. As such, the reservoir will also catch any rain water penetrating the pads when the cooler is not in use. In practice, a high level overflow pipe will be incorporated to discharge excess water from the reservoir.

Although it is particularly preferred for the air-permeable cooling means formed by the or each evaporative pad to be of planar form lying within or closely adjacent to the plane of the pitched roof, in alternative constructions evaporative pads forming the air-permeable cooling means may be arranged in an angular array while still lying close to the plane of the roof to avoid significant unsightly protuberance.

The embodiments of the invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a schematic cross section showing an evaporative cooler in accordance with the invention mounted within the roof space of a pitched roof;

Figure 2 is shows schematically the installation as viewed from the outside of the roof; and

Figure 3 is a schematic cross section through the housing of the cooler to show integral flashing formed around the outer side of the housing.

In accordance with a preferred embodiment of the invention an evaporative cooler comprises a main housing 2 adapted for installation within the roof space 4 of a pitched roof, rather than externally of the roof space as is conventional. The housing 2 is of rectangular cross-section of a width such that the housing can fit between two adjacent rafters of the roof structure subject to probable modification of the roof structure to remove part of one or possibly even two intermediate rafters to provide the requisite size. The housing 2 is substantially of wedge-shape overall such that the outer side of the housing which carries the evaporative pads 6 extends along the width of the housing and also along the length of the housing in such a way that it lies substantially within the plane of the pitched roof. Accordingly, the evaporative pads 6 are arranged in a planar array which is also substantially within the plane of the roof or parallel to the plane of the roof in close proximity thereto.

Most domestic dwellings designed in accordance with current building regulations will have rafters at approximately the same spacing and with part of just a single intermediate rafter removed, a housing 2 having a width of approximately 550mm can be accommodated and this should prove adequate for most installations as will be explained. The housing an be supported directly or indirectly from the rafters. It is to be noted that even in most installations involving conventional coolers externally mounted on the roof, an aperture having a width of similar dimension is required to permit passage of the outlet duct from the cooler into the roof space.

In the particular embodiment shown the wedge-shaped housing 2 has a base wall 8 which extends with a slight inclination towards the roof gutter line and a vertical end wall 12 mounting a duct-like extension 14 forming a housing within which a fan is mounted, the fan housing 14 having an inlet communicating with the interior of the main housing 2 and outlets 16 for connection to appropriate ducting within the roof space 4. The main housing 2 also has a system for applying water to the outer surface of the evaporative pads 6. In

one form, this can involve the spraying of water onto the pads 6 from jets arranged along at least one longitudinal edge of the planar array of pads 6, or possibly along both longitudinal edges and/or the upper or lower end edges of the pad array. The water may be sprayed from individual spray jets carried by a water manifold extending along one or more of the edges of the outer side of the main housing 2, with the spray jets being so positioned as to ensure adequate water penetration over the entire face of the pad array for maximum cooling effect. The jets may alternatively be formed by slots or holes in the manifold.

Instead of spraying the water onto the pad array, the water may be dripped onto the pad array by drip emitters carried by or formed in the manifold by holes or slots. When a drip system is used several drip manifolds may span across the width or length of the pad array, the pitch spacing of the drip emitters and manifolds being such as to ensure water penetration across the entire face of the pad array. A similar manifold arrangement could be used with spray jets.

The bottom part of the main housing 2 will form or contain a reservoir for water to be fed to the spray or drip system by a suitable pump mounted within the housing. Surplus water from the pads will also drain into the reservoir as will any rain falling on the roof and penetrating the evaporative pads when the cooler is not in use. During operation of the cooler, the reservoir will be filled with water from the mains supply via a suitable float valve. A valve-controlled outlet permits discharge of water from the reservoir as required, with an overflow outlet automatically effecting discharge when the water within the reservoir reaches a predetermined level, for example as may occur during winter months subject to rain fall with the cooler inactive.

Advantageously, the housing 2 is formed with flashing 20 (see Figure 3) around the perimeter of its outer side. The flashing along the two longitudinal edges and upper edges is designed to sit under the roofing material and the flashing along the lower edge is formed approximately 50mm higher to sit over the top of the roofing material to allow for rain water run off. Preferably, the housing including the flashing is moulded from a

suitable plastic material. As shown in Figure 3, the flashing is preferably formed with a return edge 20a of U-shape to prevent water penetration by capillary action.

Advantageously, one or more of the vertical walls of the housing 2 have inspection panels which are removable to permit access from within the roof space for full maintenance of the cooler including the sprays or drip emitters as well as internally mounted components such as the fan and pump, and replacement of the pads. The ability to effect full maintenance from within the roof space is of significance as work safety requirements may require the use of safety harnesses and safety rails if work is to be undertaken from the external surface of the roof.

Externally of the evaporative pads 6, the housing 2 may carry a grid structure sufficient to prevent a person on the roof accidentally standing on the pads and falling into the housing; it is however to be understood that the design of such a grid structure should ensure that there is no substantial impediment to air flow through the pads from the outside.

Current conventional evaporative coolers for domestic installations tend to have an evaporative pad area of from about $1m^2$ for smaller units to $2m^2$ for larger units. With the construction proposed herein with a main housing width of approximately 550mm, an evaporative pad area of approximately $1m^2$ can be achieved by a housing in which the length of its inclined outer side is approximately 2 metres and a pad area of $2m^2$ can be achieved with a wall of approximately 4 metres; even a length of 4 metres can readily be accommodated within the roof structure of most dwellings.

With the construction described, the array of evaporative pads lies substantially within the plane of the pitched roof or closely adjacent thereto. Although the array of pads is able to receive substantially unrestricted air flow from outside of the roof space and which is necessary for effective operation, the unsightly projection of conventional coolers is avoided; the presence of the cooler may not even be perceptible from the ground. The fan itself is incorporated in the part of the housing within the roof space; although some fan noise will inevitably still exist, nevertheless the external noise levels should be

substantially diminished in relation to conventional externally mounted coolers. Also, the externally mounted housings of conventional externally mounted coolers when formed from plastics material are subject to degradation arising from UV exposure and this does, in time, result in maintenance problems. In the preferred embodiment of the present invention, the plastics housing of the cooler is not exposed.

Conventional evaporative coolers have to be installed after completion of the building or at least after completion of the roof structure. The cooler in accordance with the preferred embodiment of the invention can be installed from inside of the building prior to application of the roofing material and prior to installation of the ceiling and insulating material. Accordingly, the installation can be effected without the need to fit safety railing on the roof line thereby reducing labour costs. The incorporation of the integral flashing around the housing also facilitates a substantial cost saving in installation.

The embodiment has been described by way of example only and modifications are possible within the scope of the invention.

DATED this 4th day of April 2002

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By DAVIES COLLISON CAVE

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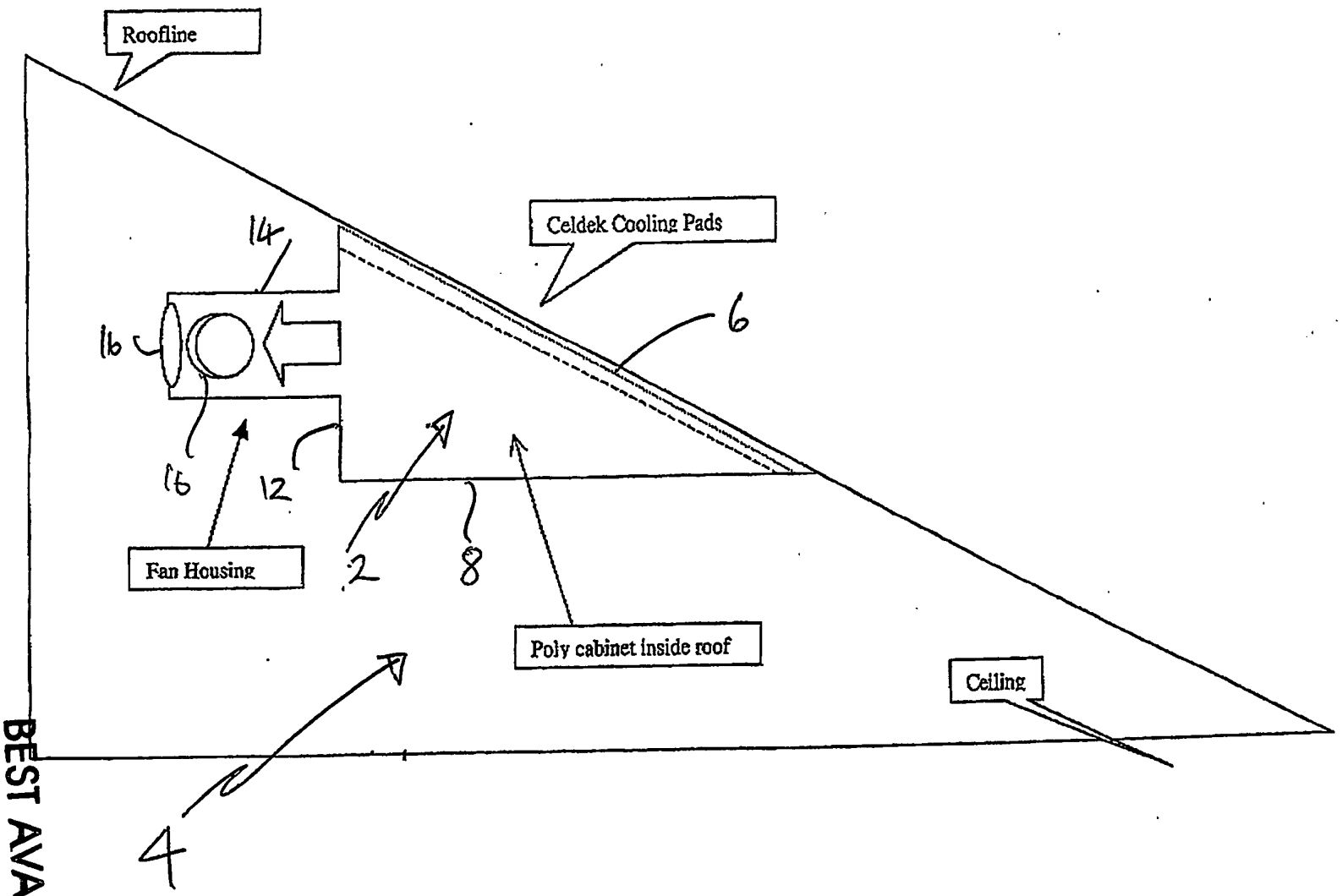
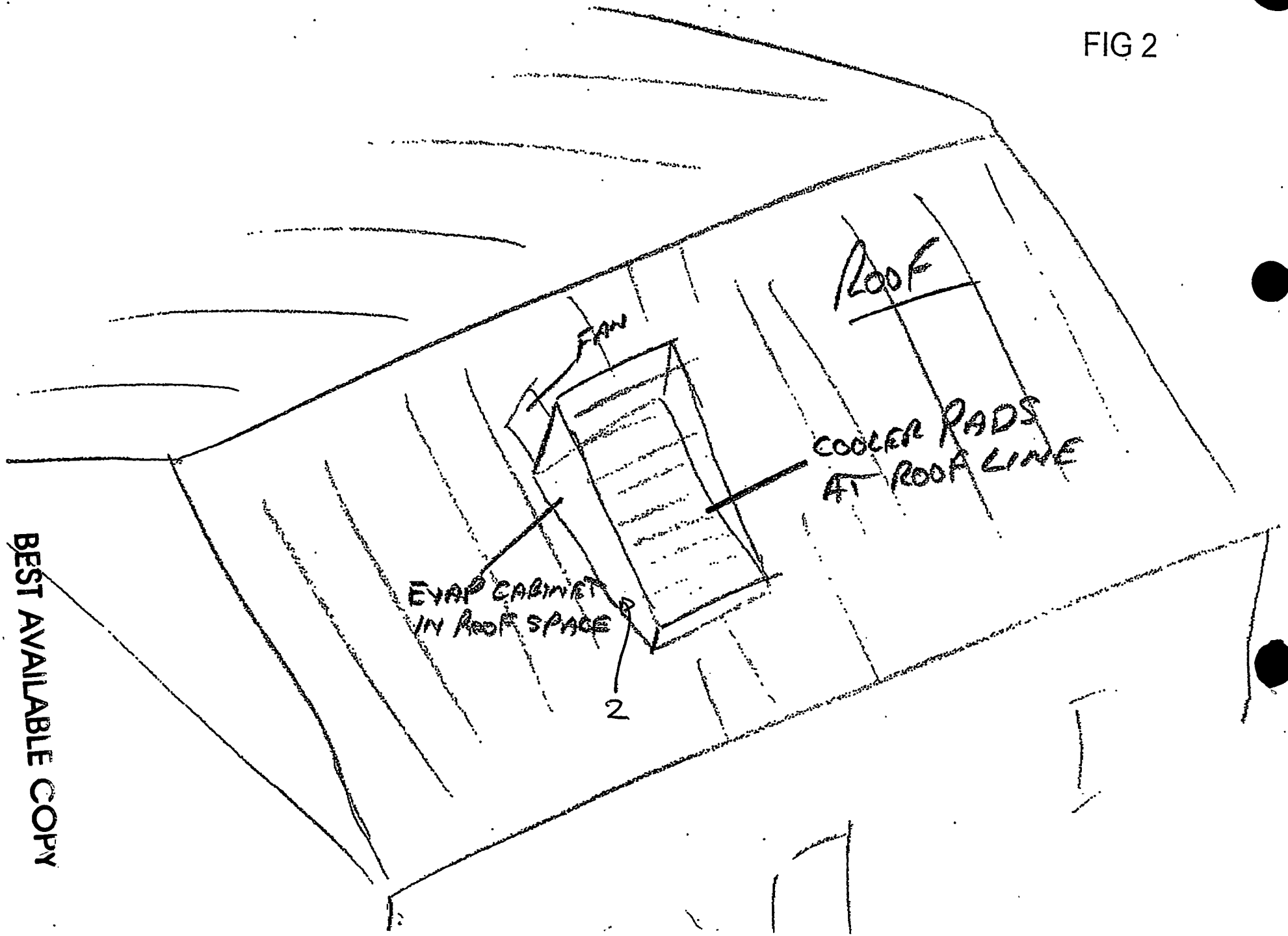


FIG 1

FIG 2



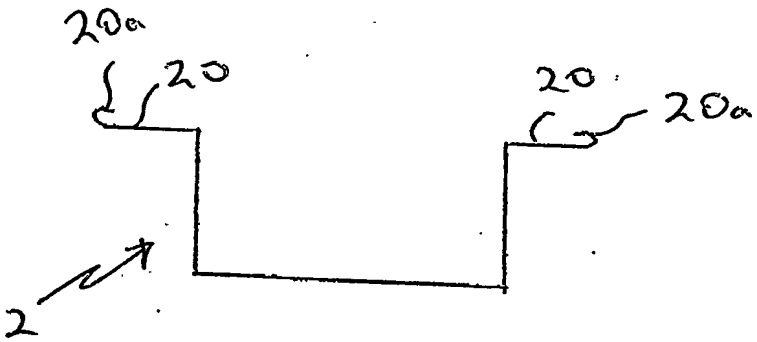


FIG 3